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INVENTOR(S): CHESLEY P. DILLON

TITLE: METHOD AND SYSTEM FOR NOTIFYING A
SUBSCRIBER OF EVENTS

ATTORNEYS: ANTHONY LUKE SIMON, ESQ.
GENERAL MOTORS CORPORATION
LEGAL STAFF
MAIL CODE: 482-C23-B21
300 RENAISSANCE CENTER
P.O. BOX 300
DETROIT, MICHIGAN 48265-3000
(313) 665-4714

METHOD AND SYSTEM FOR NOTIFYING A SUBSCRIBER OF EVENTS

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FIELD OF THE INVENTION

This invention relates generally to telematics systems. In particular the invention relates to a system and method of notifying a subscriber of events.

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BACKGROUND OF THE INVENTION

One of the fastest growing areas of communications technology is related to automobile network solutions. The demand and potential for wireless vehicle communication, networking and diagnostic services have recently increased. Although many vehicles on the road today have limited wireless communication functions, such as unlocking a door and setting or disabling a car alarm, new vehicles offer additional wireless communication systems that help personalize comfort settings, run maintenance and diagnostic functions, place telephone calls, access call-center information, update controller systems, determine vehicle location, assist in tracking vehicle after a theft of the vehicle and provide other vehicle-related services. Drivers can call telematics call centers and receive navigational, concierge, emergency, and location services, as well as other specialized help such as locating the geographical position of a stolen vehicle and honking the horn of a vehicle when the owner cannot locate it in a large parking garage.

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Information is available from a variety of sources regarding a variety of events. Managing this information and accessing the particular events of interest to a person can be time consuming. Often, a person must search for event information from several sources before locating the information they are seeking. Multimedia systems in vehicles permit access to radio stations, pre-recorded media, web sites and stored data such as stock quotes, sports scores, news, and personal reminders. A driver, interested in a traffic update, must tune to a radio station that broadcasts traffic conditions at a particular time. The driver

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must listen to other programming until the scheduled time for the traffic report arrives. Information on other events can require a search of various radio stations before the event is located. Access to web sites is generally not feasible while driving a vehicle and personal reminders or other information of interest may not be readily available.

It is desirable therefore, to provide a system and method for notifying a subscriber of events, that overcomes the challenges and obstacles described above.

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SUMMARY OF THE INVENTION

The present invention provides a method for notifying a subscriber of events. A subscriber event request is received at a call center. An event activation table is created based on the received subscriber event request. The event activation table is sent to an event table storage system. A current notification system activity is determined. The current notification system activity is suspended for the duration of a subscriber notification and the subscriber notification is sent from the event table storage system in accordance with the event activation table. The current notification system activity is resumed upon termination of the subscriber notification.

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Another aspect of the current invention provides a computer usable medium including computer program code for notifying a subscriber of events comprising: computer program code for receiving a subscriber event request at a call center, computer program code for creating an event activation table based on the received subscriber event request, computer program code for sending the event activation table to an event table storage system, and computer program code for sending a subscriber notification from the event table storage system in accordance with the event activation table. The computer usable medium further comprises: computer program code for determining a current notification system activity, computer program code for suspending the current

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notification system activity for the duration of the subscriber notification and computer program code for resuming the current notification system activity upon termination of the subscriber notification.

5 Another aspect of the current invention provides system for notifying a subscriber of events comprising: means for receiving a subscriber event request at a call center, means for creating an event activation table based on the received subscriber event request, means for sending the event activation table to an event table storage system, and means for sending a subscriber notification
10 from the event table storage system in accordance with the event activation table. The system further comprises means for determining a current notification system activity, means for suspending the current notification system activity for the duration of the subscriber notification and means for resuming the current notification system activity upon termination of the subscriber notification.

15 The aforementioned and other features and advantages of the invention will become further apparent from the following detailed description of the presently preferred embodiment, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention rather than limiting, the scope of the invention being defined by the
20 appended claims and equivalents thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of a system for notifying a subscriber of events in accordance with one embodiment of the current invention;

25 **FIG. 2** is a schematic of the event activation table in accordance with one embodiment of the current invention;

FIG. 3 is a flow diagram of a method for notifying a subscriber of events in accordance with one embodiment of the current invention;

FIG. 4 is a flow diagram detailing the step of sending the event activation table at block **330** of **FIG. 3**; and

FIG. 5 is a flow diagram detailing the step of sending the subscriber notification at block **340** of **FIG. 3**.

DETAILED DESCRIPTION OF THE FIGURES

FIG. 1 is a schematic diagram of a system for notifying a subscriber of events in accordance with one embodiment of the current invention at **100**.

Subscriber notification system at **100** comprises: a mobile vehicle **110**, a telematics unit **120**, one or more wireless carrier systems **140**, one or more satellite carrier systems **141**, one or more communication networks **142**, and one or more call centers **180**. Mobile vehicle **110** is a vehicle, such as a car or truck, equipped with suitable hardware and software for transmitting and receiving voice and data communications.

In one embodiment of the invention, telematics unit **120** comprises an event table storage system and comprises: a digital signal processor (DSP) **122** connected to a wireless modem **124**; a global positioning system (GPS) receiver or GPS unit **126**; an in-vehicle memory **128**; a microphone **130**; one or more speakers **132**; an embedded or in-vehicle phone **134** or an email access appliance **136**; a real time clock **138**; a display **139**; and a software monitor **123** for reading a time signal of real time clock **138**. DSP **122** is also referred to as a microcontroller, controller, host processor, or vehicle communications processor. GPS unit **126** provides longitude and latitude coordinates of the vehicle, as well as a time stamp and a date stamp. In-vehicle phone **134** is an analog, digital, dual-mode, dual-band, multi-mode or multi-band cellular phone.

Telematics unit **120** is configured to store event activation tables, vehicle data upload (VDU) records, and other data files in in-vehicle memory **128**.

5 Telematics unit **120** can set or reset calling-state indicators and can enable or disable various cellular-phone, telematics-unit functions and vehicle components when directed by microcode running on DSP **122**. Telematics unit **120** can send and receive over-the-air messages using, for example, a pseudo-standard air-interface function or other proprietary and non-proprietary communication links.

DSP **122** executes various computer programs and computer program
10 code that control programming and operational modes of electronic and mechanical systems within telematics unit **120**, including software monitor **123** for reading time signal of real time clock **138**. DSP **122** controls communications between telematics unit **120**, wireless carrier system **140** or satellite carrier system **141** and call center **180**. A speech-recognition engine **119**, which can
15 translate human speech input through microphone **130** to digital signals, is installed in telematics unit **120**. For example, programming of in-vehicle phone **134** is controlled with verbal commands that are translated by speech-recognition software executed by DSP **122**. Alternatively, pushing buttons on an interface of telematics unit **120** or in-vehicle phone **134** is used to change a phone number or
20 activate other functions. The interface to telematics unit **120** includes one or more buttons (not shown) on the telematics unit, radio console, or associated keyboard or keypad. In another embodiment, the interface to telematics unit **120** includes other forms of preference and data entry including touch-screens, wired or wireless keypad remotes, or other wirelessly connected devices, such as
25 Bluetooth-enabled devices or 802.11-enabled devices.

DSP **122** controls, generates and accepts digital signals transmitted between telematics unit **120** and a vehicle communication bus **112** that is connected to various vehicle components **114**, various vehicle sensors **116**, and
 5 a multimedia system **118** in mobile vehicle **110**. DSP **122** can activate various programming and operation modes, as well as provides for data transfers between telematics unit **120** and vehicle components **114** or multimedia system **118** and between telematics unit **120** and call center **180**. Signals from DSP **122** are translated into speech messages and sent out through speaker **132** of
 10 telematics unit **120** or a speaker **117** of multimedia system **118**.

Mobile vehicle **110** via telematics unit **120** sends and receives radio transmissions from wireless carrier system **140**, or satellite carrier system **141**. Wireless carrier system **140**, or satellite carrier system **141** is any suitable system for transmitting a signal from mobile vehicle **110** to communication
 15 network **142**.

Communication network **142** includes services from mobile telephone switching offices, wireless networks, public-switched telephone networks, and Internet protocol (IP) networks. Communication network **142** comprises a wired network, an optical network, a fiber network, another wireless network, or any
 20 combination thereof. Communication network **142** connects to mobile vehicle **110** via wireless carrier system **140**, or satellite carrier system **141**.

Communication network **142** can send and receive messages according to established protocols such as Dedicated Short Range Communications standard (DSRC), IS-637 standards for short message service (SMS), IS-136 air-
 25 interface standards for SMS, and GSM 03.40 and 09.02 standards. In one embodiment of the invention, similar to paging, an SMS communication is posted along with an intended recipient, such as a communication device in mobile vehicle **110**.

Call center **180** is a location where many calls are received and serviced at the same time, or where many calls are sent at the same time. In one embodiment of the invention, the call center is a telematics call center, prescribing communications to and from telematics unit **120** in mobile vehicle **110**. In another embodiment, the call center **180** is a voice call center, providing verbal communications between a communication services advisor **185** in the call center **180** and a subscriber. In another embodiment, the call center **180** contains each of these functions. In another embodiment, the call center **180** serves as a fully automated response center providing telematics service center data.

Communication services advisor **185** is a real advisor or a virtual advisor. A real advisor is a human being in verbal communication with a user or subscriber. A virtual advisor is a synthesized voice interface responding to requests from user or subscriber. In one embodiment, virtual advisor includes one or more recorded messages. In another embodiment, virtual advisor generates voice messages using a text to speech synthesis engine (TTS). In another embodiment virtual advisor includes both recorded and TTS generated messages.

Call center **180** provides services to telematics unit **120**. Communication services advisor **185** provides one of a number of support services to a subscriber. Call center **180** can transmit data via data signal, such as an event or an event activation table **210**, to telematics unit **120** in mobile vehicle **110** through wireless carrier system **140**, satellite carrier systems **141**, or communication network **142**. Call center **180** creates event activation tables **210** based on subscriber event requests and can store event activation table **210** in a call center database **186**. Call center **180** also has connections to a third party database **182**, and a subscriber database **184**. Third party database **182** is a database of events supplied by third party providers. Subscriber database **184** is a database that contains events supplied by the subscriber. Call center database **186** is a database that contains events supplied by call center **180**.

Call center **180** can determine mobile identification numbers and telematics unit identifiers associated with a telematics unit access request, compare mobile identification numbers and telematics unit identifiers with a database of identifier records, and send calling-state messages to the telematics unit **120** based on the request and identification numbers.

In one embodiment of the invention, a user **172** has a local provisioning system such as a user computer **150** or a handheld device **170**, such as a personal digital assistant (PDA). Local provisioning system has a wireless modem to send data through wireless carrier system **140**, or satellite carrier system **141**, which connects to communication network **142**. In another embodiment, local provisioning system has a wired modem, which connects to communications network **142**. Data is received at call center **180**. Call Center **180** has any suitable hardware and software capable of providing web services to help transmit messages and data signals from local provisioning system, such as, user computer **150** or handheld device **170** to telematics unit **120** in mobile vehicle **110**. In another embodiment, user computer **150** or handheld device **170** has suitable hardware and software to connect to mobile vehicle **110** using a direct link to a mobile vehicle onboard data port. In another embodiment of the invention, a user **172** uses a phone **160** to communicate with the communications network **142**.

Speech recognition software is installed in telematics unit **120** and is referred to as a speech recognition engine **119**. Speech recognition software is executed by DSP **122**. In one embodiment, pressing a button (not shown) in vehicle **110** activates speech recognition engine **119**. Pressing the button sends a signal that places the telematics unit in audio arbitration mode allowing it to respond to speech commands. A text to speech synthesizer **121** can convert text strings to audible messages that are and played through speaker **132** of telematics unit **120** or through speakers **117** of multimedia system **118**.

In one embodiment of the invention event activation table **210** is transmitted to telematics unit **120** through communication network **142** and stored in memory **128** of telematics unit **120**. Event activation table **210** is read by software running on DSP **122** and events are provided to subscriber in accordance with event activation table **210**. Events are enunciated by text to speech synthesizer **121**, through speaker **132**, played through speaker **117** of multimedia system **118**, or shown on display **139**.

FIG. 2 is a schematic of the event activation table in accordance with one embodiment of the invention at **200**. Event activation table **210**, is composed of at least one record **220** having an event field **230**, a time and time field **240**, and an access identifier field **250**. The entries in the fields of each record **220** are determined from a subscriber event request **260** created by a subscriber and received at the call center **180**.

The subscriber event request **260** is created when the subscriber requests events via a menu accessed within the vehicle **110**. Subscriber can also create a subscriber event request **260** by requesting events via a web page or over the phone with a real or virtual advisor. A list of available events is supplied by call center **180**. Subscriber can also request a non-listed event. Examples of events that a subscriber can request are: weather forecasts, traffic conditions, stock prices, sporting event scores and highlights, movie listings and show times, entertainment choices, birthdays, anniversaries, other special occasions and news reports.

After an event is requested, a text string, or event descriptor, that represents the event is written to the event field **230** of a record **220** in the event activation table **210**. The event descriptor can also be text, such as sports scores or stock quotes, extracted from an event source, or a reminder message created by the subscriber. The subscriber specifies the date and time for event notification or specifies that call center **180** determines event notification date and time. The notification time and notification date is written to the date and time field **240** of the record **220** in the event activation table **210**.

An access identifier linked to each event in the event activation table **210** identifies the source for that event. Examples of access identifiers are a radio frequency to tune to, a URL to index to, or database to extract from. The access identifier can also point to the event field **230** of the record **220** in the event activation table **210** when the event field **230** contains text to provide to the subscriber, such as a reminder message. The subscriber optionally includes a source for the requested event. If the subscriber does not select a source for the event, call center **180** determines the event source. The event source is written to the access identifier field **250** of the corresponding record **220** in the event activation table **210**.

Once event activation table **210** is created, call center sends it to telematics unit **120** of vehicle **110**. Subscriber event request **260** includes at least one event. If a requested event is unavailable, a record **220** is created in the event activation table **210** with a null event. The subscriber is then notified that the event is unavailable.

Requested events, in the event field **230** of a record **220** in the event activation table **210**, are provided to the subscriber by sending a subscriber notification. The delivery date and time, in the date and time field **240** of the record **220**, is the activation condition that triggers subscriber notification. The linked access identifier, in the access identifier field **250** of the corresponding record **220** identifies the source of the event and an event notification system in vehicle **110** provides the subscriber with the event. Examples of event notification systems are a text to speech synthesizer that enunciates the event, a multimedia system that broadcasts the event or a display that shows the event.

FIG. 3 is a flow diagram of a method for notifying a subscriber of events in accordance with one embodiment of the current invention at **300**. The method for notifying a subscriber of events at **300** begins (block **305**) when a subscriber event request is received at a telematics call center (block **310**). An event activation table is created, at the call center, based on the subscriber event request and includes a record for each requested event. The record contains the event with its associated notification date and time, and an access identifier (block **320**).

Once the event activation table is created, it is sent to an event table storage system such as a telematics unit (block **330**). A current notification system activity is determined (block **340**) and a record of the current notification system activity is maintained in memory in the telematics unit as part of the determination. Examples of current notification system activity are the radio frequency the radio is tuned to or a CD that is playing, prior to a subscriber notification. Current notification system activity is suspended for the duration of a subscriber notification (block **350**). The subscriber notification, which comprises the event, is sent in accordance with each record in the event activation table stored in the event table storage system (block **360**). The current notification system activity resumes after the subscriber notification terminates (block **370**) and the method ends (block **395**).

FIG. 4 is a flow diagram detailing the step of sending the event activation table at block **330** of **FIG. 3** at **400**. Sending the event activation table at **400** begins (block **405**) when a data connection is established between a call center and an event table storage system, such as a telematics unit (block **410**). The data connection is initiated by the call center advisor, either a virtual advisor or a real advisor, by the subscriber, or by the event table storage system. The event activation table is sent when the event table storage system is active. A telematics unit is active when the ignition switch of the vehicle in which it is installed is on or when it is in the wake state of a wake/sleep cycle. Once the

data connection is established, the event activation table is transmitted to the event table storage system using the data connection (block **420**) and the method ends (block **495**).

5 **FIG. 5** is a flow diagram detailing the step of sending the subscriber notification at block **340** of **FIG. 3** at **500**. Subscriber notification at **500** begins (block **505**) when a software monitor reads a time signal (block **510**). The real time clock of an event table storage system, such as a telematics unit, generates the time signal. The time signal either does or does not correspond with at least
10 one date and time from the date and time field of a record in the event activation table (block **520**). If the time signal does not correspond with at least one date and time from the date and time field of a record in the event activation table, reading the time signal repeats (block **510**). If the time signal does correspond with at least one date and time from the date and time field of a record in the
15 event activation table, an event notification system is activated (block **530**). The event notification system, such as the vehicle's multimedia system or a text to speech synthesizer, provides the event to the subscriber according to the access identifier linked to the event (block **540**) and the method ends (block **595**). If activation of the event notification system fails, event notification system
20 activation can repeat a predetermined number of times. If providing the event according to the linked access identifier fails, providing the event can also repeat a predetermined number of times. An alternate notification, such as a phone or an email message, is possible, if the repeated attempts at activation of the event notification system fail or the repeated attempts at providing the event fail.

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One example of event notification using the in-vehicle multimedia system is when the event is traffic conditions. The event activation table would have "traffic update" in the event field, the date and time that a traffic update is available in the date and time fields, and the radio frequency of the radio station that broadcasts the traffic update in the access identifier field. In this example, the radio station, at the particular radio frequency, provides traffic updates every ten minutes. The subscriber through the subscriber event request calls for traffic updates from 0800 to 0820 every day from Monday through Friday during September. The event activation table would have multiple records for traffic updates each having a traffic update event with associated times of 0800, 0810, and 0820 and associated dates of all weekdays in September. Each of these records would have the radio frequency of the radio station in the access identifier field. When the first record's date and time corresponds to the time signal from the real time clock, the radio of the vehicle's multimedia system tunes to the specified radio frequency and the traffic update is provided to the subscriber. In this example, the subscriber can provide the radio frequency when submitting the event notification request or the call center can specify a radio frequency that satisfies the subscriber's request.

In another example, the subscriber requests an anniversary reminder on the day before the anniversary. The event activation table has a record with the phrase "remember anniversary tomorrow" in the event field, the desired notification date and time in the date and time field and "text to speech" in the access identifier field. When the event's notification date and time corresponds to the time signal from the real time clock, the text to speech synthesizer enunciates the phrase "remember anniversary tomorrow."

In a further example, the subscriber requests a stock quote for company GM at 1630 EST every Monday through Friday in September. The event activation table would have multiple records each having a stock quote event with an associated time of 1630 and an associated date of a weekday in September. Each of these records has either a database pointer or a financial website URL in the access identifier field. When the date and time of the first record corresponds to the time signal from the real time clock, the text to speech synthesizer would enunciate the stock quote, for company GM, retrieved from the appropriate database or the financial website. In this example, the subscriber can designate a source for the stock quote when submitting the subscriber event request or the call center can identify a source for the stock quote.

In an alternate embodiment of the invention, the subscriber selects an activation condition, other than a date and time, that triggers subscriber notification, such as, arriving at a particular GPS location or when a predetermined number of miles has elapsed. Supplying weather information at a location when a subscriber travels to that location is an example of using an activation condition other than a date and time. The activation condition is the GPS coordinates of the location and would replace the date and time fields on the event activation table. The event is weather and the access identifier is a radio frequency broadcasting weather information.

In another embodiment of the invention, the subscriber requests an event that does not have a known date and time, such as when band X is touring at a particular location. The subscriber event request remains at the call center until the information is available. When the information is available, an event activation table is created and sent to the telematics unit. The subscriber notification is then sent when the vehicle is subsequently started.

While embodiments of the invention disclosed herein are presently considered to be preferred, various changes and modifications can be made without departing from the spirit and scope of the invention. The scope of the invention is indicated in the appended claims, and all changes that come within
5 the meaning and range of equivalents are intended to be embraced therein.